

NASA/SPoRT

GOES-R Activities in Support of Product Development, Management, and Training

Kevin Fuell¹, Gary Jedlovec², Andrew Molthan², Geoffrey Stano³

¹*University of Alabama Huntsville/NASA SPoRT Center, Huntsville, Alabama*

²*NASA Short-term Prediction Research and Transition (SPoRT) Center, Huntsville, Alabama*

³*NASA SPoRT / ENSCO, Inc., Huntsville, Alabama*

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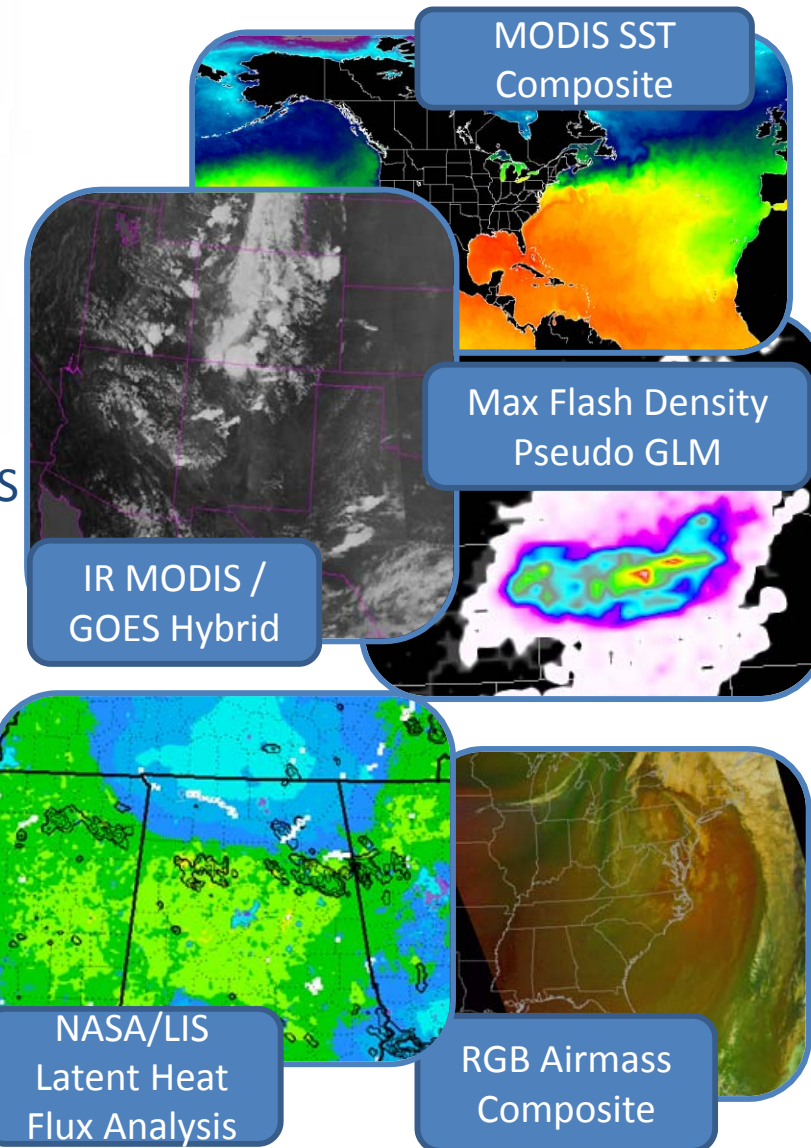


Transitioning Unique NASA Data and Research Technologies to Operations

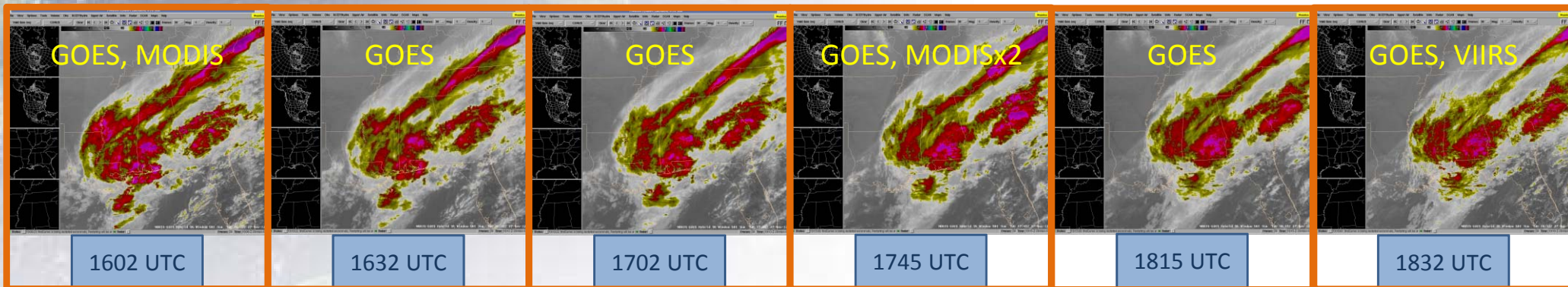


SPoRT, GOES-R PG, Overview

- What is NASA/SPoRT?
 - Mission: Transition unique NASA and NOAA capabilities to operations to improve short-term weather forecasts on a regional and local scale.
 - Challenge > Product > DSS > Assess
- What is the GOES-R Proving Ground (PG)?
 - Mission: Demonstrate future capabilities of GOES systems using proxy data in order to improve day-1 products and user readiness
 - SPoRT provides ABI- and GLM-type products via near realtime NASA instruments and works with users to make them available in their display systems.
- Presentation Overview
 - ABI proxy from MODIS & VIIRS
 - GLM proxy and tools to manage the data
 - Training for Proving Ground users

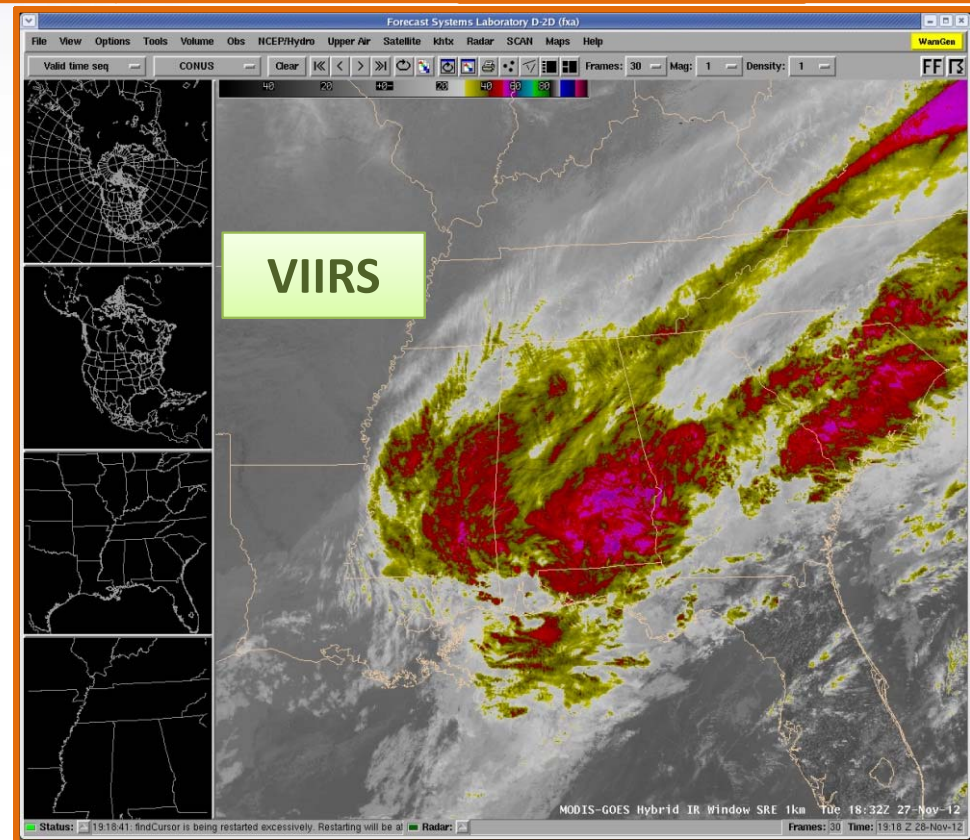


MODIS, VIIRS – proxy to GOES ABI



ABI will have 16 channels, resolution of 2 km IR / 500 m visible, every 5 minutes

- MODIS and VIIRS provide near real-time proxies to ABI, but without the high temporal frequency.
- In order to “loop” imagery, a GEO/LEO “Hybrid” inserts MODIS and VIIRS into a base GOES image (see right).
- SPoRT used this “Hybrid” concept to demonstrate ABI capabilities to users for longwave and shortwave infrared imagery, water vapor, and visible imagery (example next slide).



Operational Evaluation of Hybrid as Proxy for GOES-R ABI

Las Conchas Fire

New Mexico, June 2011

GOES East parallax
puts fire too far
west

Los Alamos

Santa Fe

Next time
step

Location and
intensity of
hotspots are better

Los Alamos

Santa Fe

SPoRT Hybrid Imagery (GOES 3.9 channel used as a base image every 15 minutes)

SPoRT Hybrid Imagery (MODIS 3.9 channel is insert at this time, to replace GOES)



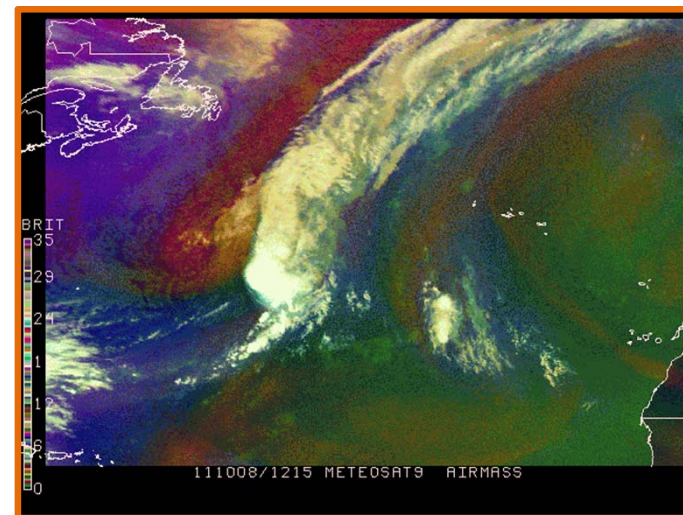
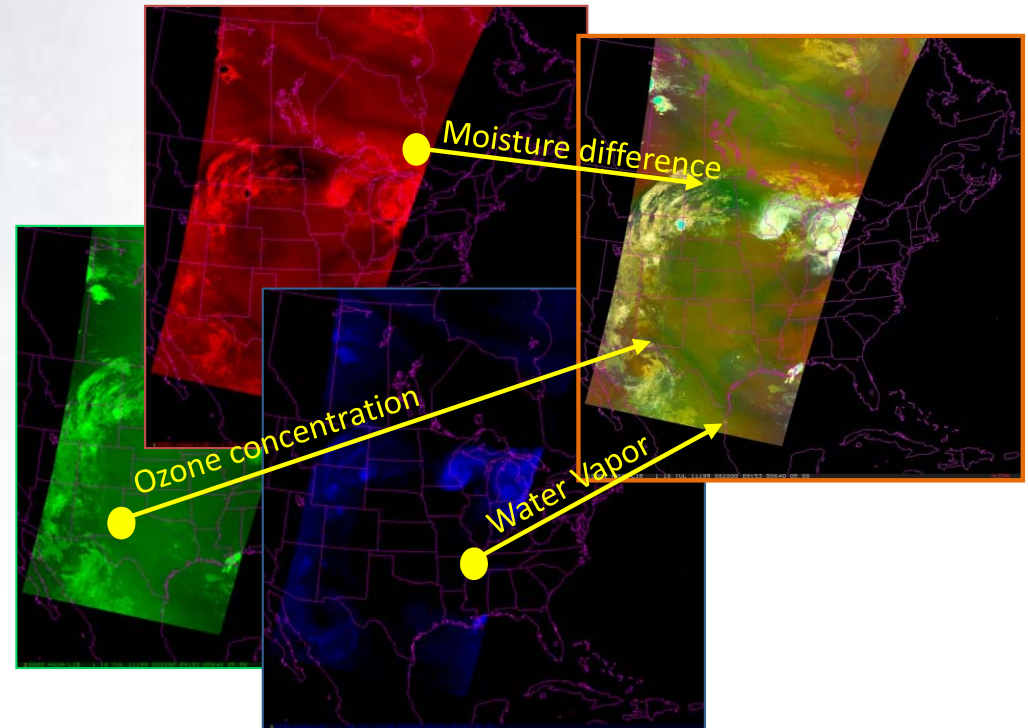
Rain over burn scar
results in flash flood of
ash & debris through
agricultural region,
two months after fire.

Courtesy of Kevin Fuell (SPoRT) and Brian Guyer (NWS / ABQ)

- SPoRT developed Hybrid GOES-POES imagery using MODIS and VIIRS to allow infusion of NASA data into operations
- SPoRT lead an evaluation period with 8 NWS Forecast Offices using the Hybrid
- The above example comes from the NWS Albuquerque's use during record breaking wild fire season where burn scar locations were better monitored and recorded
- 30 product surveys collected over 4 weeks; 86% of users recommended the product to their peers and 70% indicated the product had noticeable to large impact

Composite Imagery (RGB) – a large shift in satellite imagery use and increased efficiency in GOES-R era

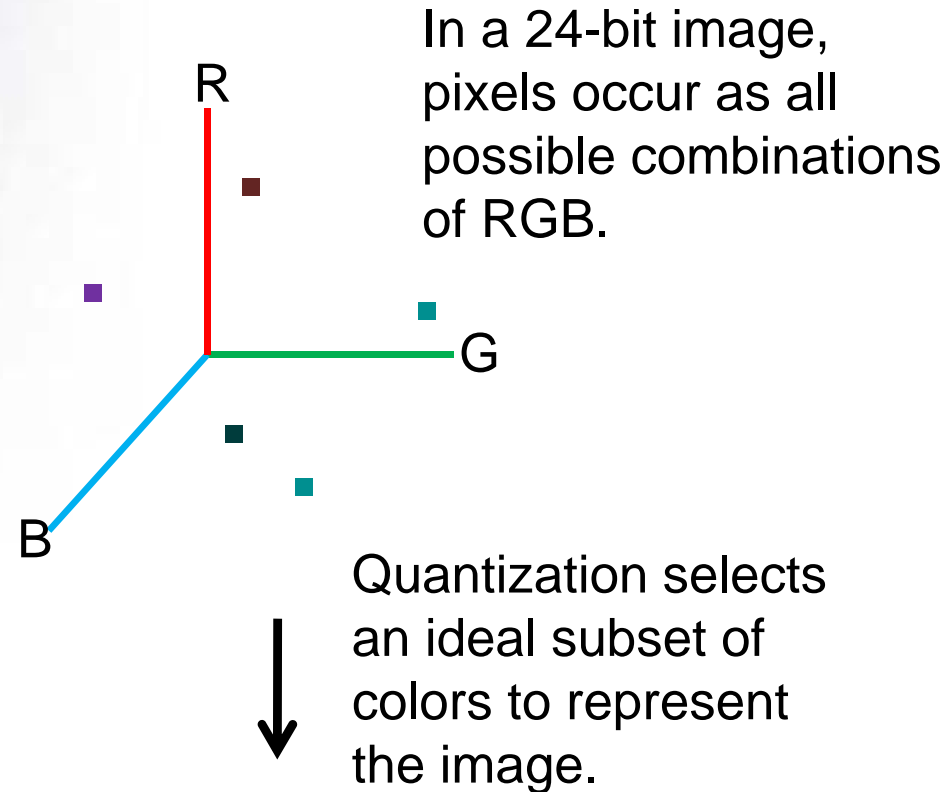
- **What is composite Imagery?**
The use of multiple channels to show atmospheric moisture, temperature, and microphysical properties in a single image
- **Who is using it?**
EUMETSAT has experience via SEVIRI on MSG; SPoRT is using their standard “recipes” with MODIS and VIIRS to transition to NWS Forecast Offices and National Centers
- **Why is it important?**
SPoRT is exposing operational users to composite imagery as a method to more efficiently use the increased number of channels from the GOES-R ABI instrument (16 channels vs 5).



Airmass RGB
used by NHC to
monitor
extratropical
transition of
Hurricane
Philippe

RGB Production - Color Quantization

- RGB imagery assign values for the R, G, and B color components using 8-bit values (0-255), resulting in 24-bit image.
- NWS software (AWIPS and NAWIPS) can presently display 254 or 95 colors, respectively.
- Therefore, RGB images in these systems are *quantized* (not ideal, but exposes users to RGB concept ahead of 24-bit capability).
- Code re-engineered to be more modular for use with EUMETSAT RGB recipes.
- SPoRT creates a suite of RGB products from multiple instruments (MODIS, VIIRS, SEVIRI, GOES Sounder, SSMI/S, TRIM)



Some color detail is lost as a compromise to make the imagery available in N/AWIPS.

WFO RGB Applications – Small Scale

Farmington Airport

1819 Z

Wave cloud (blue) and dust plume (pink)

Additional Information:
Dry air (purples) vs
humid air (blues)

2000 Z

ABQ forecaster noticed odd change
in ceiling at Farmington.

Looked at visible RGB and then D
1819Z

Source stopped. Plume
drifts downwind. New
plume in CO

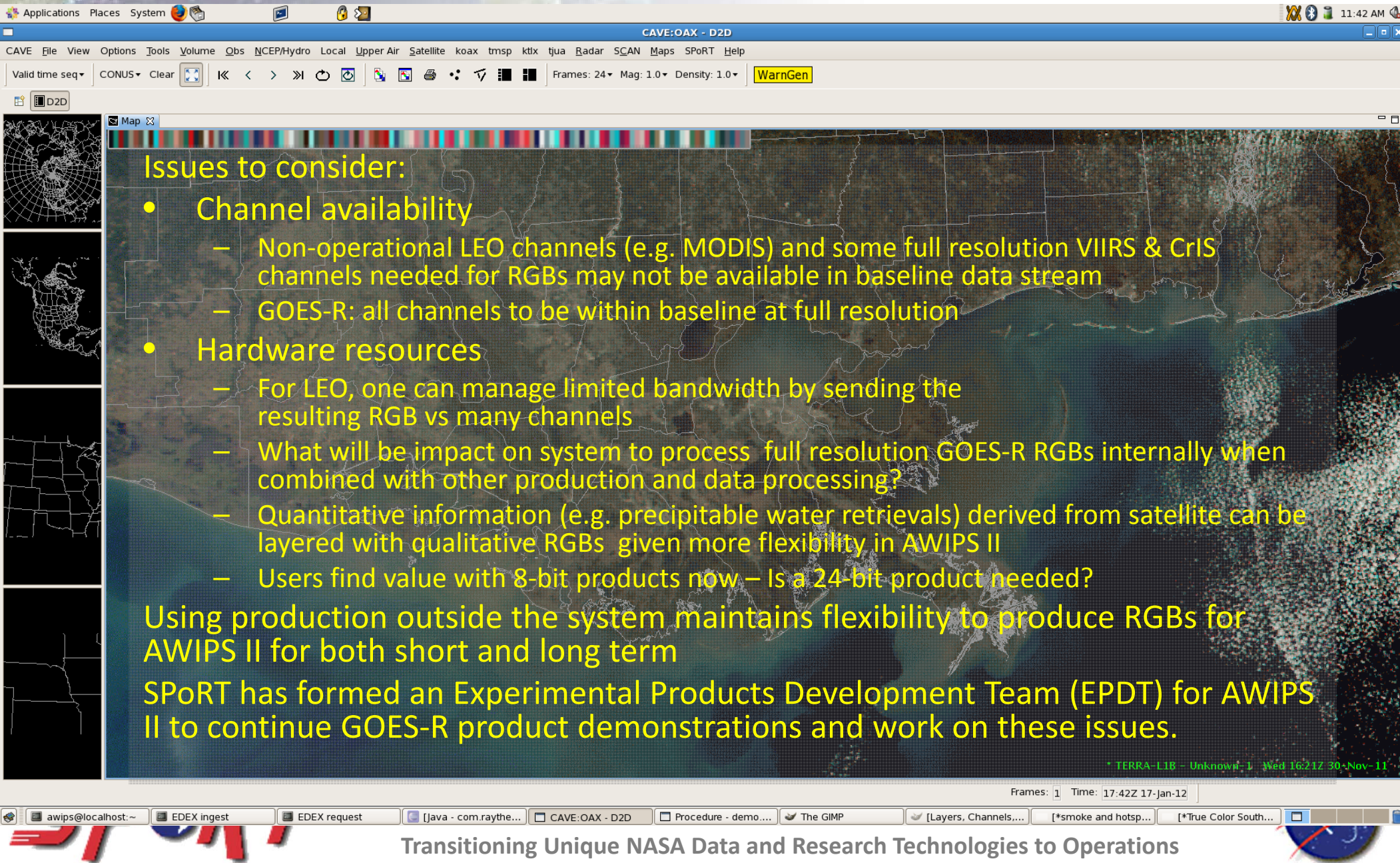
- Forecaster modified forecast ceiling
and visibility in TAF

Applications:

- Awareness of visibility and airborne hazards to aviation for TAF forecasts
- Notification to State agencies issuing public health statements
- Communication to Department of Transportation for motorist hazards on major roadways
- Inform outdoor State & National Park areas

source
at

Composite RGB Production in the Future using AWIPS II



Issues to consider:

- **Channel availability**
 - Non-operational LEO channels (e.g. MODIS) and some full resolution VIIRS & CrIS channels needed for RGBs may not be available in baseline data stream
 - GOES-R: all channels to be within baseline at full resolution
- **Hardware resources**
 - For LEO, one can manage limited bandwidth by sending the resulting RGB vs many channels
 - What will be impact on system to process full resolution GOES-R RGBs internally when combined with other production and data processing?
 - Quantitative information (e.g. precipitable water retrievals) derived from satellite can be layered with qualitative RGBs given more flexibility in AWIPS II
 - Users find value with 8-bit products now – Is a 24-bit product needed?

Using production outside the system maintains flexibility to produce RGBs for AWIPS II for both short and long term

SPoRT has formed an Experimental Products Development Team (EPDT) for AWIPS II to continue GOES-R product demonstrations and work on these issues.

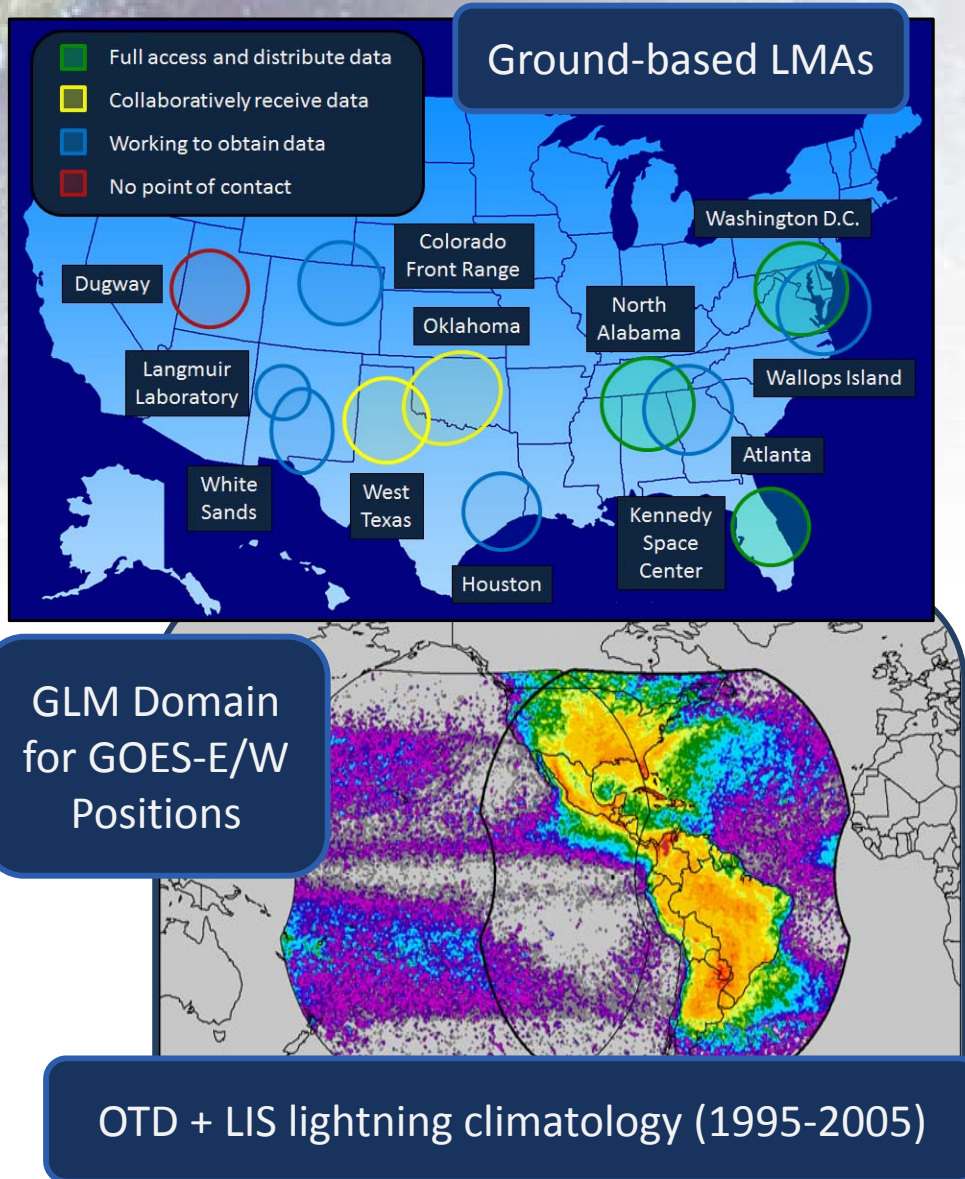
TERRA-L1B - Unknown - 1 Wed 16:21Z 30-Nov-11

Frames: 1 Time: 17:42Z 17-Jan-12

awips@localhost:~ EDEX ingest EDEX request [java - com.raythe... CAVE:OAX - D2D Procedure - demo... The GIMP [Layers, Channels,... [*smoke and hotsp... [*True Color South...

Transitioning Unique NASA Data and Research Technologies to Operations

SPoRT Leading Demonstrations of the Geostationary Lightning Mapper (GLM)

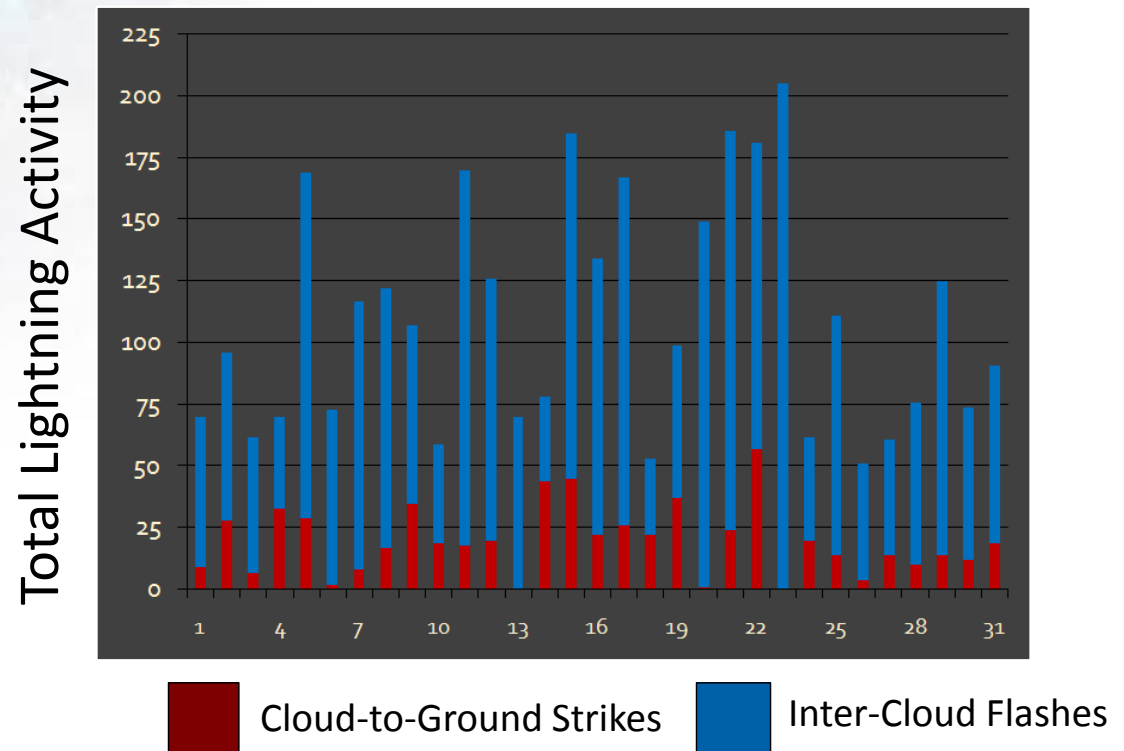


What is the GLM?

- Based on proven technology
 - Optical Transient Detector and Lightning Imaging Sensor
 - Optical sensors
 - Non-geostationary
- Detects cloud top optical pulses
- Resolution: 8 km (nadir), 14 km (edge)
- Continuous coverage
 - Near full disc domain versus limited domains of current ground-based lightning mapping arrays
 - ~90% night and day detection

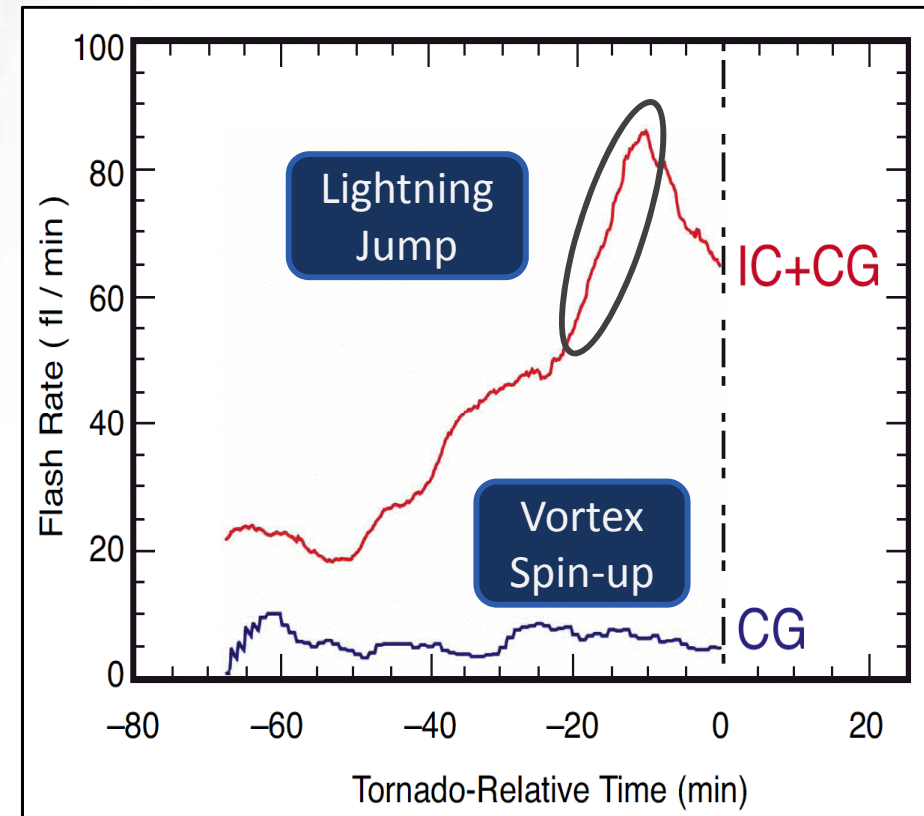
GLM - What Is Total Lightning?

- Intra-cloud AND cloud-to-ground lightning
- Observes flashes that the National Lightning Detection Network cannot
- More than a point source observation
- ~90% of all lightning is intra-cloud flashes (on average)



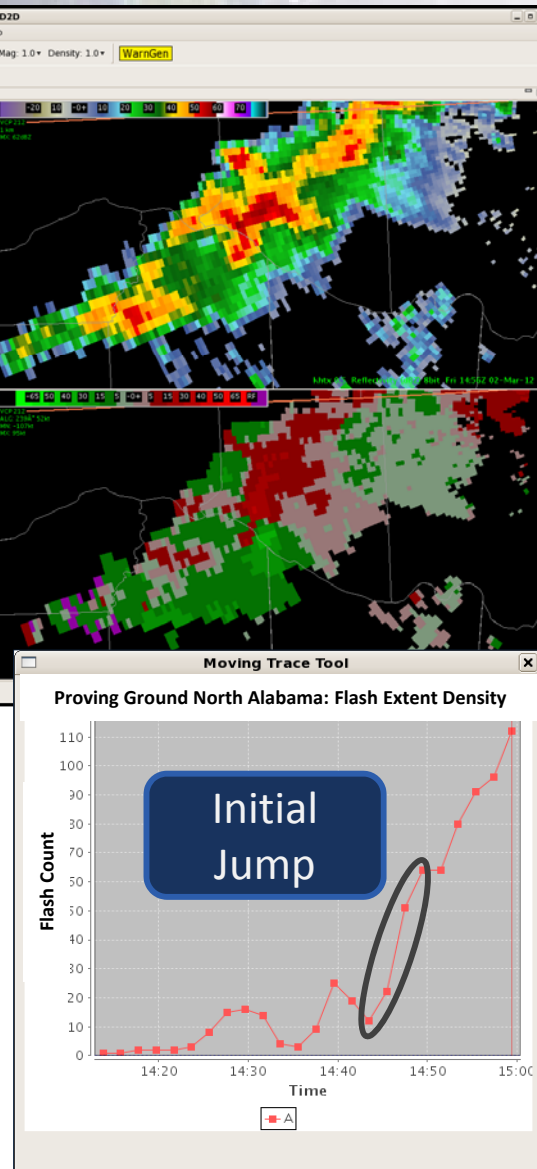
Importance of Total Lightning via GLM

- Related to updraft strength
- Rapid increase (decrease) indicates storm strengthening (weakening)
- Key concept behind lightning jump algorithm
- Total lightning enhances situational awareness (i.e. which storm intensifying) and warning decision making
- Improves severe weather warnings and lightning safety



GLM - Lightning Tracking Tool for AWIPS II

AWIPS II example of pseudo GLM trending tool on 2 March 2012, 15 minutes prior to tornado touchdown



- #1 request by forecasters
- Display real-time time series trend (unavailable in AWIPS I)
- SPoRT has developed this in AWIPS II to better identify lightning jumps
- Can be extended for:
 - IC to CG ratio
 - Lightning jump algorithm
 - Other data fields

Training to Support GOES-R

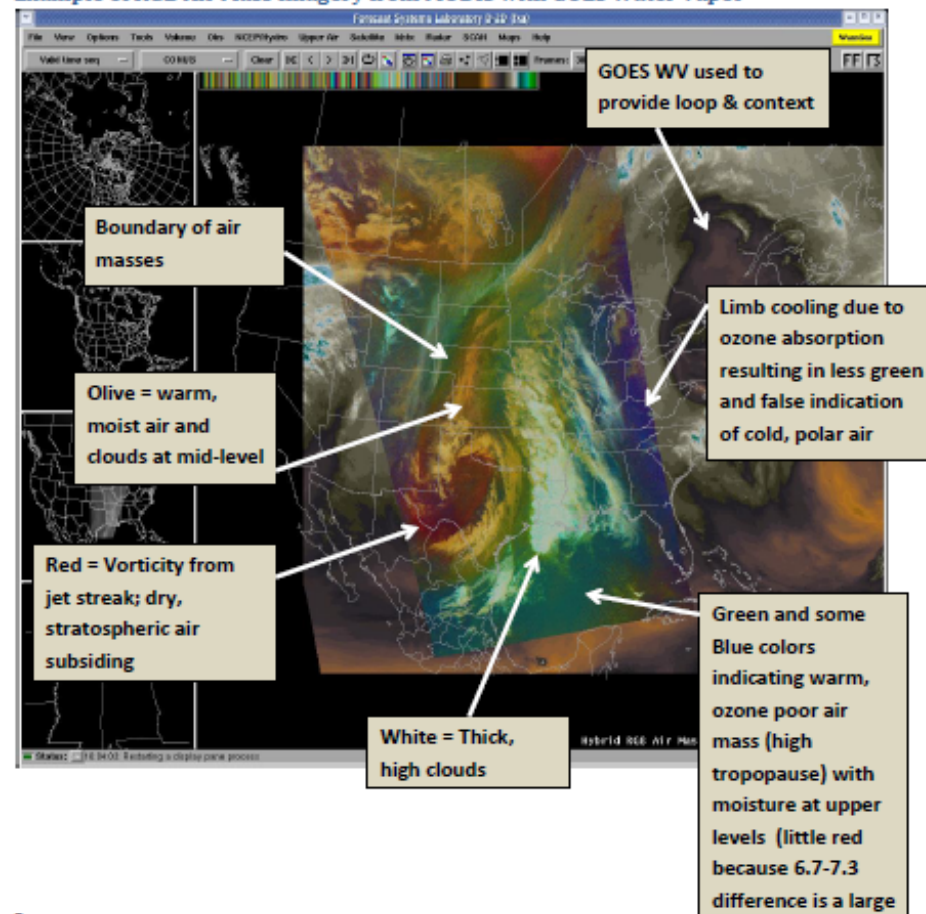
User-based training for total lightning, fog, hybrid imagery, RGB composites have been provided to testbed users

- Teletraining with experts
- Web-based modules on NOAA LMS
- Quick Guides for operations areas (see right)
- Collaborative modules with GOES-R Satellite Champions and Partners
- Hands-on training via office visits and workshop attendance (i.e. HWT)

Testbed users contribute examples and cases to revise training materials for use by a wider audience.

Page 2 of Air Mass Quick Guide

Example of RGB Air Mass Imagery from MODIS with GOES Water Vapor



Resources:

This guide provides a highlight of the Air Mass RGB product as quick reference. Operational applications of RGB imagery can be seen on SPoRT's blog site (<http://nasasport.wordpress.com/>). A primer of the RGB imagery concept can be found at the UCAR/COMET MetEd website (<https://www.meted.ucar.edu>). More in depth information can be found at EUMETRAIN's website (<http://eumetrain.org/>).

Conclusions

- SPoRT is using current capabilities of MODIS and VIIRS, combined with current GOES (i.e. Hybrid Imagery) to demonstrate mesoscale capabilities of future ABI instrument.
- SPoRT is transitioning RGBs from EUMETSAT standard “recipes” to demonstrate a method to more efficiently handle the increase channels/frequency of ABI
- Challenges for RGB production exist
 - Internal vs. external production, Bit depth needed, Adding quantitative information, etc.
 - SPoRT forming group to address these issues
- SPoRT is leading efforts on the application of total lightning in operations and to educate users of this new capability
- Training in many forms is used to support testbed activities and is a key part to the transition process

